LINEUP WITH MATH™

Math-Based Decisions in Air Traffic Control
for Grades 5 - 9

Problem Set A

Introduction to Real Air Traffic Control

Teacher Guide with Answer Sheets

Overview of Problem Set A

In this Problem Set, students will be introduced to the key ideas, vocabulary, units, and graphical representations of air traffic control.

An introductory two-minute video, *What is LineUp With Math™?*, introduces students to the *LineUp With Math™* activities.

The heart of the Problem Set is a six-minute instructional video, *Welcome to Sector 33*.

Both videos are available on the *LineUp With Math™* website and can be projected for whole class viewing. Alternatively, students can access the videos from the ATC Simulator homepage and watch them on an individual computer monitor.

After viewing *Welcome to Sector 33*, students reinforce their understanding of the key concepts via the Problem Set A Student Workbook that provides a structured learning environment with paper-and-pencil worksheets.

Objectives

Students will:

- Learn the vocabulary of air traffic control.
- Learn the units (nautical miles and knots) of air traffic control.
- Learn to read and interpret an airspace sector diagram.
- Learn the air traffic control spacing requirements for safety and efficiency.

Prerequisites

None

Materials

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- ThreeVideos:
  - -- Animation of 24 hours of flight in the US
  - -- *What is LineUp With Math™*
  - -- *Welcome to Sector 33*
- Student Workbook A (print-based)

The materials are available on the *LineUp With Math™* website:

http://www.smartskies.nasa.gov/lineup

Videos

All three videos are available for download on both the *LineUp With Math*™ website and the Simulator website.

The first video, *Animation of 24 hours of flight in the US*, compresses 24 hours of flight paths to one minute. The video illustrates the world's biggest distance-rate-time-problem and motivates the study of air traffic control.

The second video, "*What is LineUp With Math*™?", introduces students to the overall goals and activities, and features scenes of students engaged in *LineUp With Math*™.

The third video, *"Welcome to Sector 33"*, presents the vocabulary, units, and graphical representations used in air traffic control. It prepares students for their first session with the interactive ATC Simulator. It also prepares students for the activities in the first Student Workbook (Problem Set A).

Student Workbook

It is recommended that you have a copy of Workbook A open while you read these notes.

The Workbook consists of two worksheets.

For each worksheet, the key points are briefly described as follows.

Worksheet: *Introduction: Understand Real Air Traffic Control*

- Students may confuse "nautical miles" and "knots. "Nautical miles" are a measure of distance; "knots" are a measure of speed (nautical miles per hour).
- Students may have difficulty reading a sector diagram to determine a plane's exact starting distance from MOD. For example:

    -- When the distance is not a multiple of five (e.g., for distances such as 28 Nmiles.).
    -- When a plane passes through OAL on its way from LIDAT or MINAH.

Worksheet: *Understand Aircraft Spacing Requirements*

- At MOD, air traffic controllers line up all Sector 33 planes to proceed to the next sector. Controllers aim for Ideal Spacing (3 Nmi) at MOD. Everywhere else, planes must have at least Minimum Separation (2 Nmi).

Answer Sheets

Answer sheets for each worksheet in Student Workbook A can be found in Appendix I of this document.